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ABSTRACT

The problem of how multimedia institutions should choose specific media for various learning tasks is explored in this informally-written paper. Several approaches to the problem are reviewed and rejected as unsatisfactory solutions. The steps described in Briggs' "Handbook of Procedures for the Design of Instruction" are briefly reviewed and shown to require analyses so complex that they must be rejected due to time and money constraints. The need for guiding principles for media selection, based on research, is emphasized; and some exploratory studies in this direction are mentioned. (WDR)

ABSTRACT

This paper begins by posing the question of how multi-media systems should choose media for various learning tasks. It describes some of the approaches made to this problem, mostly by American researchers, and comments on why these approaches, in the author's view, have not been successful in providing useful answers.

The paper outlines a study (financed by the Council of Europe) that was a renewed attack on the problem, and explains what difficulties were experienced.

Briggs' 1970 Handbook of Procedures for the Design of Instruction provides a series of steps leading to media selection. These steps are examined in this paper and shown to require complex analyses beyond the ability of many instructional designers or of their resources of time and money.

The paper describes in a general way how the Open University allocates media on certain rules of thumb, and how these allocations determine to some extent the expectations of course teams, resulting in a kind of media selection. The need in the University for guiding principles for media selection, based on research, is emphasised, and some indication is given of research beginning in the Institute of Educational Technology at the University that may hasten the evolution of these principles.

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MEDIA TAXONOMIES AND MEDIA SELECTION

Introduction

One of the questions I am frequently asked by visitors to the Open University is, "How do you choose which media to use for different parts of your multi-media courses?'

I feel that I am expected, in answer, to point to a beautifully constructed algorithm and explain how a carefully balanced analysis of pedagogical factors leads to the best choice. In fact, I have to admit that no such algorithm or analysis exists, and that the University's selections of media are controlled by logistical, financial and internal political factors rather than by soundly based and clearly specified psychological and pedagogical considerations.

I don't like admitting this: it seems as though it is not to the credit of the University, a leader in the multi-media field. But I don't feel too defensive about it. The fact is that instructional researchers and designers have not provided even the foundations for constructing strong practical procedures for selecting media appropriate to given learning tasks. If there has been British work in this area, I have been unable to discover it. In West Germany, the Deutsches Instituut fur Fernstudien has recently turned its attention to the problem (Dohmen, 1972). In the United States, over 2,000 media studies have not yielded the answers we need.

In this paper I shall summarise some of the approaches made to this problem and will comment upon them before telling you of a recent study financed by the Council of Europe. I shall then examine in detail the advice on media selection in the principal published handbook on instructional design procedures. Having cleared the ground, as it were, I shall try to explain how the Open University deals with this problem at present. Finally, I should like to indicate the directions the media research in the Institute of Educational Technology is likely to take in the light of these findings and the University's needs.

Prepared by Professor David G. Hawkridge, Director of the Institute of Educational Technology, The Open University, Milton Keynes, England.

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The problem approached

In an article published in 1968, Saettler (1968), an authority on media, stated bluntly that instructional design was still an 'unexplored theoretical and research frontier, with no texts or guidelines for designing instructional media messages'. He said that the media research of over 50 years had had little relevance to the problems of instructional design. In particular, he noted that, 'What we need are criteria and procedures whereby we may match a medium to the requirements of a learner. An urgent need exists for a taxonomy of instructional media which can provide a systematic approach to the selection and use of media for educational purposes'.

Briggs (1967) wrote how he was constructing a programmed text one day in 1964 when he suddenly began to wonder why programming had to be the best medium for that particular instructional message. He undertook a literature survey, and concluded that, 'there hadn't been any research on how to choose the best medium of instruction for particular teaching objectives'.

Twyford (1969) wrote a review article for the fourth edition of the Encyclopedia of Educational Research, but in it he has little to say on media selection or media taxonomies. He notes the large number of studies comparing one medium with another, and claims that the research shows that a medium's effectiveness is more dependent upon the nature of the message than upon the characteristics of the medium. He refers to selecting media on the basis of their relative efficiency and makes vague allusions to the use of systems analysis and behavioural objectives. I looked in vain for solid advice on media selection.

As I dug deeper into the work done up to about 1968, I realised that there had been one or two attempts to identify the theoretical bases on which instructional design should proceed. Glaser (1966), for example, suggested some psychological considerations; some would not agree with his behavioural approach, and I shall note a few of its practical weaknesses in dealing with Briggs' work later.

Meredith (1965) put forward suggestions for a taxonomy of educational media. He envisaged a four-fold classification of variables:

a) physical variables in the material, and the form of the physical medium providing the stimulus;
b) the neuro-anatomical variables in the sensory-motor structures involved in the responsive behaviour of the learner;
c) ecological variables which take account of architectural and other environmental factors

d) a collective set of variables which embody the time dimension, factors of memory, learning, growth, history of the student, attention, purpose, expectation, imagination and anticipation.

This very comprehensive classification indicates emphatically that we are dealing with a multi-variate design problem, in which simplistic analyses will have no place. It makes the work of Fleming (1967) on the classification and analysis of instructional illustrations seem elementary and merely preliminary. Fleming provided a taxonomy of illustrations which included physical types, verbal modifier (captions, etc.) types, educational objective types, and subject matter types. More recently, Jamieson (1973) has attempted to relate visual media to different categories of learning tasks, but he offers little guidance for multi-media system designers.

Edling (1968), in a review of educational objectives and educational media, added nothing that would help me, although he touched on a large number of studies of different learning modes and media.

Sometime in the 1960s, perhaps arising from the work of Glaser, Briggs and others in America, people writing about the systems approach to education and what an ideal educational system would look like began to insert in their flow-diagrams a box that said 'Select media' or something equivalent. Silvern (1964) Schagin and Poorman (1967), Kaufman (1968), Lechmann (1968), Haney, Lange and Barson (1968), and Gerlach and Ely (1971) are among those I noted using this approach. In fact, I myself have written in these terms (Hawkridge 1970), and in Germany Schmidbauer (1970) has done the same. I am not suggesting that we were all wrong, but I do think we underestimated the contents of the box. That leads me to tell you about the Council of Europe study.

The Council of Europe Study

Some 2½ years ago I proposed to a technical committee of the Council of Europe that an attempt should be made to produce a media taxonomy. I told them that what was needed was a practical guide to instructional designers working in multi-media systems for teaching adults at a distance, like the Open University. The work plan envisaged the possibility of selecting appropriate media for given learning tasks, having regard to the characteristics of the learners. My idea was not original; I worked in the same Institute as Briggs in California. I hoped that the Council could go beyond what Briggs and his colleagues had reported in 1967 in their classic monograph on instructional media design (Briggs, Campeau, Gagné and May, 1967).

As a first step, the Council commissioned an updating of part of that monograph. Campeau, who did the original literature review, was asked to prepare a selective review of the results of research on the use of audio-visual media to teach adults (Campeau, 1972). At the same time, Kaye prepared

a set of learning tasks in the natural sciences (Kaye, 1972), following Gagne's (1970) suggestion that the most important single criterion for a choice of medium is often the nature of the learning task.

I had some hopes that Campeau would be able to find some guiding principles in the research since 1965, the date of the original review. In fact, in spite of an extremely thorough search, she found little. This is not the place to explain why: her report does so, very well. She concludes that the research is yet to be done that may yield principles for media selection, and makes some suggestions about how this research might be designed. She foresees, for example, that multi-variate analysis will be required to detect not only main treatment effects but also interactions between variables. I shall come back to that point later.

When Kaye had prepared his set of learning tasks or objectives, it was at once clear that there would be fundamental problems in using it as a basis for media selection. The set itself is well compiled. The problems arise chiefly from levels of specificity and from the inadequacy of language for conveying full intentions. These, of course, are the problems that plague anyone trying to use Mager or Glaser-type behavioural objectives in instructional situations. A comprehensive paper by Macdonald-Ross (in press) deals with these and other difficulties in formulating and using objectives, and I will not go into them here. It is enough to say that one of the most fundamental obstacles in the way of preparing algorithms for media selection is that tasks cannot easily be specified at an appropriate level. If we examine three of the tasks listed in Kaye's paper, this point will be clear.

1. Describe how the relativistic mass of an object changes as the speed of the object increases towards that of the speed of light.
2. Demonstrate how Avogadro's Law and Dalton's Law of partial pressures may be derived from the gas law and simple kinetic theory.
3. Compare and contrast igneous and metamorphic rocks in terms of their differing mineral content.

Each of these tasks or objectives has to be broken down, and decisions have to be taken about how much of their <u>intellectual context</u> is to be taught, before media can be chosen. Is 1. to be undertaken simply through writing the right formula? To teach the right formula then becomes the task for which media must be selected, but even that task must still be broken down into what Briggs calls instructional events. More likely, however, 1. includes far more. The same remarks apply to 2. In 3. we might reasonably expect more than a bookish understanding of the differences between the kinds of rocks. Students

might handle them, or look at microscope slides of rock-sections, and so on. None of these tasks is actually specified.

My comments are not an attack upon Kaye's list. They are intended to emphasise the difficulty of selecting appropriate media before a very detailed analysis has been carried out. Such an analysis may be feasible, but not as a routine practice, to be employed by relatively untrained personnel, as I had originally proposed. The question of whether such reductionism is desirable also remains to be answered.

This conclusion is an important one for educational technologists, and needs to be examined in the light of the principal published prescription for instructional systems design, Briggs' 1970 Handbook.

Briggs' Prescription

If we are looking for a systems model for the design of instruction, with the idea of governing media decisions with specific kinds of learners in mind, then Briggs' (1970) handbook deserves to be studied closely. This volume, entitled Handbook of procedures for the design of instruction, is the culmination of years of work in the field (Briggs 1967, 1968). Its theoretical foundations appear to rest partly in Glaser's behavioural approach and partly in Gagné's (1965) book, The conditions of learning. Certainly the handbook is the most comprehensive existing treatment of the topic. It was tried out in Briggs' classes at Florida State University.

Briggs claims that in his handbook the entire process of instructional design is described, in an orderly series of steps to be taken. He says too that in this process 'media are deliberately and carefully chosen to comprise a certain strategy of instruction, ...the objective being to employ the most effective media for each (instructional) event'.

What is the process of instructional design that Briggs describes? He lists the three main components as:

a) specification of instructional objectives;
b) development of tests measuring attainment of those objectives;
c) selection of media and design of instructional materials.

For the third component, the one that interests us now, Briggs offers this behavioural objective for readers of his handbook:

For each instructional event.....you choose a medium of instruction and defend your choice on the basis of one or more of the following:

a) a systematic model for the design of instruction.
b) other theoretical or logical analysis models.
c) research findings in this subject-matter area.
d) other documented evidence (not intuition).

It seems quite clear from these excerpts, especially from the warning about not using intuition, that Briggs is about to put forward in the handbook what I am looking for, a logical way of selecting media for instruction. His flow-chart has a box labelled 'Select media'.

In the chapter on media selection, however, we find we are little better off than before we started. The reasons are much the same as those I encountered in the Council of Europe study. The complete summary of Briggs' instructional design steps (see Appendix) is too long to discuss here, so I shall concentrate on those steps relating directly to media selection.

Briggs wants us to choose a medium of instruction to match each instructional event. He expects the designer trying to select media to start off by turning what is to be learned into what Briggs calls 'competencies'. For each competency the designer thinks up one or more instructional events. When the designer has accomplished this arduous analysis, in which he is called upon to make a large number of judgments without adequate supporting criteria, he will have a long list of instructional events. The next step is to analyse for each event what stimuli would be most appropriate, considering somehow both learner and task characteristics. Only after all this has been completed does the designer list the media alternatives available and appropriate for presenting the stimuli. Then he makes a tentative selection of one medium.

Diagram 1 summarises the stages:

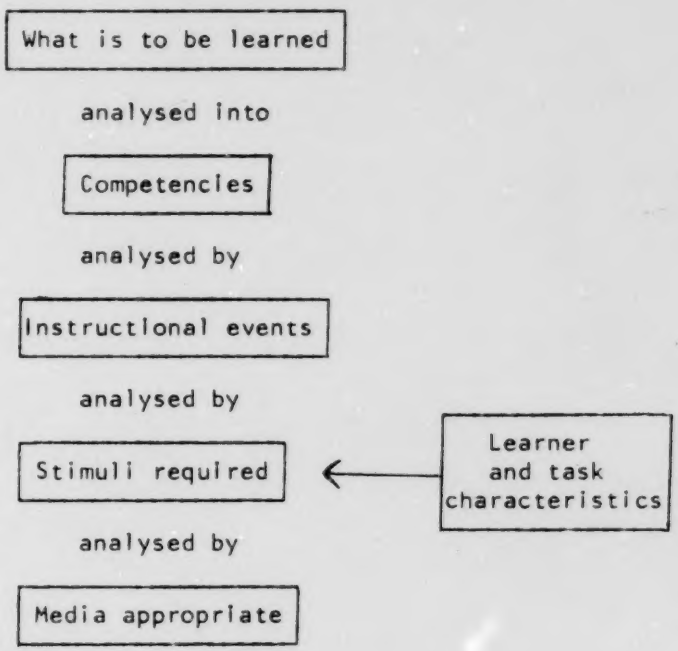

Diagram 1. Selected steps from Briggs' (1970) procedure for instructional design.

At this point we hear a sharp note of reality. Briggs sees that the learner cannot easily switch from one medium to another at very frequent intervals during a complex learning task, and he suggests in an anti-climactic way that final decisions about selecting media are made in practical terms of what makes a good "package".

Briggs provides some examples of how his own graduate students have followed the routine. Perhaps it is again a matter of words being inadequate to convey full intentions, but I am not impressed by the examples he has chosen. The problems of using the routine show up in the analysis he provides. I am afraid it would take too long to provide a detailed critique of even one example, say that for the objective: "Given any circle, the student will be able to compute the degrees in any segment of the circle'. From studying this example, however, I would say that a number of media could have been used quite easily to the same ends.

What Briggs offers the designer is a series of difficult analyses ending in some commonsense decisions. I do not doubt that the commonsense decisions are usually better informed after such analyses, but I do doubt whether it is practical to propose this routine for everyday use. Even if it were practical, is the routine likely to take into account the interactions between variables assumed in Meredith's taxonomy and referred to by Campeau? I think not.

At this stage you are probably hoping that somebody will come up with a better idea. I certainly am. But I don't think we have one at the Open University, yet.

Media allocation vs. media selection in the Open University

How has the Open University tried to deal with the problem of media selection? Its staff certainly have not indulged in Gagné or Briggs analyses.

To some extent, the problem of media selection has been dodged by resorting to media allocation. By media allocation, I mean the process by which courses receive quotas of each medium. The course team chairman knows near the start of the course development cycle how much he will have of various media available in the system. For example, he will be told how many broadcasts on television and radio he has, how much printed material can be produced, whether he can send out tape recordings, and so on. Most of these items are allocated according to rules of thumb, well in advance.

Once the chairman knows his budgets and quotas, the problem is how best to use them. The people who have a say in what goes into which medium include the academic subject-matter specialists, the BBC producers, and the educational technologists. They tend to fix first what should go into the

printed material, but it is very hard to generalise about the ways in which media decisions are taken within the framework of the budgets and the quotas. What can be said is that once a certain amount of, say, television time is secured, this has an influence on course design, encouraging course producers to change their objectives to take advantage of television. Of course, they only have that television time because they put up a pedagogical case of some kind in the first place. For instance, science course teams will claim a larger quota of television on the grounds that they need to demonstrate scientific principles, while a course on the history of music will ask for extra radio.

In the early days of the University's growth there was less competition for resources than there is now. The fact that course producers quite often want now more than they eventually get is a stimulus towards more rigorous thinking out of what is needed. Where demand exceeds supply, argument is fiercest about how best to use what is available. Over the next few years the debates should rise in standard, with producers being increasingly careful in their media selection.

As yet, however, the University has not codified or made explicit the criteria for its internal media selection. Nor has it tackled on a broad front the problem of integrating the media. Briggs clearly assumes in his examples that there is to be integration of media, with one medium being used for one learning task within a series, then another for another. True, he is working on the microscopic level, as we have seen. Integration at that level is fairly rare in the University's courses, although it occurs generally at the macroscopic level.

Media research in the Open University

It seems very unlikely that Briggs' analyses will ever be used in the Open University, except perhaps experimentally, and then on a small scale. Media allocation, based mainly on logistical, financial and internal political considerations, is likely to continue to provide the operating framework for the University's vast production. The influence of psychological and pedagogical factors on this allocation system, and on the detailed selection of media content, can grow, however, if two of the research programmes in the Institute of Educational Technology are successful. One, directed by Dr. Bates, concerns the broadcast media; the other, under Mr. Macdonald-Ross, concerns textual communications. Both are in their infancy at present, but it is worth noting their aims.

Among the objectives of the broadcast media project are the following:

a) to draw up and test a list of the most appropriate functions for television and radio on a multi-media system;

b) to produce design models for multi-media teaching systems, including:

   i) models ensuring the full integration of broadcasting with other components;

   ii) criteria for deciding on the allocation of broadcast resources;

   iii) criteria for deciding on the kind and extent of broadcasting resources needed.

This partial listing indicates the interrelatedness of problems of media selection and allocation. It also indicates that we expect to go on working at the macroscopic level.

One of the principal research tools we hope to use is content analysis (Gerbner, et al., 1969). By analysing in various ways the content of what the University has already made, we hope to be able to start compiling the list of functions. These analyses in retrospect, as it were, will probably lack the detail of Briggs' but they should enable us to make generalisations about how the media are being used in various courses or for various purposes. The generalisations, in turn, should have some influence on how new courses are produced and on how the media are allocated to and used in them.

In much the same way, the textual communication project is searching for design principles that can be used in new course production. Content analyses will be necessary here too to find out what different subject-matters require in textual communication, and how the effectiveness of the texts can be enhanced.

As course teams are offered better ways of designing course material, both broadcast and textual, they may decide to alter their media mix, using more or less text or radio or television than is the custom now for the same type of course, depending on what shifts they make to other media.

In other words, the Institute of Educational Technology is relying on a cyclic evolution of design principles, based on careful analyses of experience, rather than Briggs' prescriptive approach. To be fair to Briggs, he does expect the media choices arrived at through his routine to be tested out, and revised on the basis of their effectiveness. That proposal takes us to another question being approached not only by Dr. Bates but also by an Institute team working under Professor Lewis, with a Ford Foundation grant: How do we measure the effectiveness of various media?

Allen (1971), who has worked in media research for several decades, recently declared, 'The time is far off...when we can identify an instructional problem, then faultlessly select the proper instructional mix to solve it'. It will take some years to evolve design principles for the University, but I believe it needs them, and should use these principles, 'NOT INTUITION', (to quote Briggs for the last time).

Summary

In this paper I began by posing the question of how the Open University, or any multi-media system, should choose media for various learning tasks. I have described and commented upon some of the approaches made to this problem, mostly by American researchers. In my view, these approaches have not been successful in providing useful answers. I have explained how the Council of Europe agreed to finance a further study. I have told you what was done by Campeau and Kaye, and what difficulties the study came up against.

I have shown you how my hopes that Briggs might offer a suitable design procedure were not fulfilled, on account of the need for such complex analyses before media selection. I have described in a general way how the Open University allocation of the various media, made on rules of thumb, determines to some extent the expectations of course teams and results in a kind of media selection.

I have said that I believe that the University and other multi-media systems really need guiding principles for media selection, based on research, and I have told you a little about the research beginning in the Institute of Educational Technology that may hasten the evolution of these principles.

There must be others present who have thought about the problem to which this paper has been addressed. I shall welcome discussion.

David G. Hawkridge
22nd February, 1973.

REFERENCES

ALLEN, W.H. (1971). Instructional media research. Audiovisual Communication Review, 19, 5-18.

BRIGGS, L.J. (1967). Multi-media instruction: a true story. Audiovisual Instruction, March.

BRIGGS, L.J. (1967). A structure for the design of multi-media programmes. Audiovisual Instruction, March.

BRIGGS, L.J. (1968). Learner variables and educational media. Review of Educational Research, 38, 160-176.

BRIGGS, L.J. (1970). Handbook of Procedures for the Design of Instruction. Pittsburgh, American Institutes for Research.

BRIGGS, L.J., CAMPEAU, P.L., GAGNE, R.M., and MAY, M.A. (1967). Instructional Media: a Procedure for the Design of Multi-media Instruction, a Critical Review of Research, and Suggestions for Further Research. Pittsburgh, American Institutes for Research.

CAMPEAU, P.L. (1972). Selective Review of the Results of Research on the Use of Audiovisual Media to Teach Adults. Strasbourg, Council of Europe.

DOHMEN, G. (1972). Mediendidaktik. Paper presented at a Council of Europe symposium at Bad Godesberg, September 1972.

EDLING, J.V. (1968). Educational objectives and educational media. Audiovisual Communication Review, 18, 177-194.

FLEMING, M. (1967). Classification and analysis of instructional illustrations. Audiovisual Communication Review, 15, 246-258.

GAGNÉ, R.M. (1965). The Conditions of Learning. New York, Holt, Rinehart and Winston.

GAGNÉ, R.M. (1970). Learning theory, educational media and individualised instruction. In: Commission on Instructional Technology. To Improve Learning: a Report to the President and the Congress of the United States. Washington, D.C., U.S. Government Printing Office.

GERBNER, G., HOLSTI, O.R., KRIPPENDORFF, K., PAISLEY, W.J., and STONE, P.J., (Eds.), (1969). The Analysis of Communication Content: Developments in Scientific Theories and Computer Techniques. New York, Wiley.

GERLACH, V.S. and ELY, D.P. (1971). Teaching and Media in a Systematic Approach. Englewood Cliffs, N.J., Prentice-Hall.

GLASER, R. (1966). Psychological bases for instructional design. Audiovisual Communication Review, 14, 433-449.

HANEY, J.B., LANGE, P.C. and BARSON, J. (1968). The heuristic dimension of instructional development. Audiovisual Communication Review, 16, 358-371.

HAWKRIDGE, D.G. (1970). Long-term prospects for educational technology in Southern Africa. Symposium.

JAMIESON, G.H. (1973). Visual media in a conceptual framework for the acquisition of knowledge. Programmed Learning and Educational Technology, 10, 32-39

KAUFMAN, R.A. (1968). A system approach to education: derivation and definition. Audiovisual Communication Review, 16, 415-425.

KAYE, A.R. (1972). A Set of Learning Tasks in the Natural Sciences. Strasbourg, Council of Europe.

LEHMANN, H. (1968). The systems approach to education. Audiovisual Instruction, 13, 144-148.

MACDONALD-ROSS, M. (in press). Behavioural objectives - a critical review. Instructional Science.

MEREDITH, O. (1965). Towards a taxonomy of educational media. Audiovisual Communications Review, 13, 374-84.

SAETTLER, P. (1968). Design and selection factors. Review of Educational Research, 38, 115-128.

SCHMIDBAUER, M. (1970). The Application of Combined Teaching Systems and the New Aspects and Functions of Education Which Depend on them. Strasbourg, Council of Europe.

SILVERN, L.C. (1964). Designing Instructional Systems. Los Angeles, University of California.

SMITH, M.D., SCHAGIN, M., and POORMAN, L.E. (1967). Multi-media systems: a review and report of a pilot project. Audiovisual Communication Review, 15, 345-69.

TWYFORD, L.C. (1969). Educational communications media. In: Ebel, R.L. (Ed.), Encyclopedia of Educational Research, 4th edition, New York, Macmillan.